DATA PROCESSING DIGEST

1140 South Robertson Blvd., Los Angeles 35, California

a publication of Canning, Sisson and Associates, Inc.

VOLUME 5 NUMBER 4

APRIL, 1959

THE UNIVERSITY OF MICHIGAN

APR 13 1959

BUSINESS ADMINISTRATION LIBRARY

© 1959
Canning, Sisson and Assoc., Inc.

Programing

GENERALIZATION: KEY TO SUCCESSFUL ELECTRONIC DATA PROCESSING

W. C. McGee, General Electric Co., Richland, Washington
JOURNAL OF A.C.M., January 1959; pages 1-23

There are three reasons why installing and maintaining EDP systems is so costly. First, the limited machine speed and capacity demands that extensive attention be given to programing for the most efficient use. This vast expenditure of manpower in turn tends to make rapid and frequent program improvement difficult or impossible. Second, the arbitrary language of the machines requires time-consuming and error-prone program writing, as well as expensive conversion from one machine to another. Third, the difficulty in defining most applications causes much experimentation with system models.

While these handicaps are gradually being overcome with new machines, new methods (such as automatic programing), and an increasing understanding of systems, another approach has been taken by the G. E. Hanford Atomic Products Operation in Richland to "provide the programmer with techniques which minimize the cost of experimenting with new systems and revising existing systems." This is "a technique... whereby the machine can be instructed to carry out certain frequently occurring operations [found in] certain broad data processing operations which are common to all or most data processing applications." An example of this kind of operation is sorting of file data. These generalized routines are made up of certain parameters which specify key elements in the operation, and particularize the routine to the present application.

For example, in the generalized sort routine, "the parameters defining this particular sort--the length of the record to be sorted, the size and position in the record of the control fields--are punched into a card. This card and the file to be sorted are the input to the processing. The output is a new file containing the original records in the desired new order."

Two other data processing operations at Hanford have been recognized as fundamental to most applications: file maintenance and

CONTENTS

1 Programing
6 Applications
10 Systems Design
12 General Information
17 Equipment
17 Comment
20 References
21 Meetings
23 Training

report generation. The generalized file maintenance routine works as follows: "Changes that are to be made to a file of data on magnetic tape are submitted in the form of handwritten 'change notices.' The information on these change notices is keypunched into cards, and the cards are submitted, along with the tape to be maintained, for 702 processing. During processing, the 702 rummages through the file until it finds the record corresponding to the first 'change card.' Having found this record, it makes the changes to the record indicated on the change card. It then searches the file again to find the record corresponding to the next change card, makes the indicated changes, and so forth. This continues until all the change cards have been processed." At the same time, the computer prepares a file of records containing a detailed description of all changes made. This file is then used to prepare change reports to check against the original change notices to assure correct recording.

Change codes tell the computer which field to look for

The generalized file maintenance routine is supplied with information about the file it is presently maintaining through a group of special records called field format description records, which are recorded at the head of the data file. "Each field format description record describes a different field in the file record, [consisting] of the name of the field, its size, and similar information. Each field is also assigned a number, by means of which reference to the field may be made on file maintenance change notices. Field format description records are supplied when a file is originally created, and, because they are physically a part of the file, need not be supplied again each time the file is maintained.

"The very first step in file maintenance processing, then, is to read the field format description records from the file and generate the particular instruction patterns required to process the present file." The generalized file maintenance routine can also alter the format of the records in a file as the file is being maintained, by adding, deleting, or changing the size of fields. This is done by supplying a special field format change card. These cards "are processed before the data change cards to make the indicated changes in the format section of the file, and to insure that each record in the file is correspondingly modified as it is processed. This feature takes a great deal of the risk out of initially setting up a file. If, for example, an item is overlooked when the file is being set up, it can quickly and easily be included at a later time by means of this format change feature."

Formats are easily altered

To use the generalized report generation routine, the programer first defines the report desired on an EDPM output definition form. "In the top part of the form, the report is laid out exactly as it is to appear in its final form.... The lower part of the form is used to specify which fields in the record are to appear on the report. For each field, two kinds of information are needed: 1) where the field is to come from, i.e., its position in the file record; and 2) where the field is to go, i.e., its position in the report.

"The completed output definition form is then keypunched directly into cards, and the cards are submitted, along with the file, for 702 processing. As the first step in the processing, the report generation routine reads the output definition cards and generates the particular instruction patterns required to prepare the report. The generated program then takes over, selecting out of each record in the file (which may be either on cards or on tape) those fields designated in the output definition and placing them in an auxiliary record in a form suitable for printing. When the file has been completely processed, the auxiliary records are printed on a line printer.

Report generation is simplified

"An important feature of the report generator is its ability to produce any reasonable number of independent reports from a given file on a single machine run. Output definition cards for each report desired are punched in the usual manner, and submitted for processing in 'packets,' one packet for each report to be generated. During processing, the report generation routine generates a separate, independent program for each packet submitted. As each record in the file is read, the generated programs are executed, one after another, so that the various reports are generated essentially simultaneously."

Other features of the generalized report generator are: the possibility of listing information from selected records, the automatic formation and printing of up to 15 totals of designated fields in different records, automatic page numbering, automatic record count, elimination of zero-printing, group indication (suppression of printing of common line identifications), and the generation of records for use in subsequent processing.

Now one source file is sufficient

The generalized routines have made it possible to maintain one source file containing information which can be drawn off for use in a large number of related but distinct applications. This source file has advantages over separate independent files in that there is no duplication of effort, maintenance may be done in a single operation, and it may be considered as an authoritative information source.

Another advantage of the generalized routines is that they provide the flexibility needed in the installation or revision of data processing systems. An additional basic operation in data processing systems, that of calculation, cannot at the present time be generalized. However, the four operations--sorting, file maintenance, report generation, and calculation--form the "building blocks" from which any data processing system may be constructed. These building blocks can be moved around freely,"allowing management to experiment with different models of the system and to make system revisions without rupturing the fabric of closely-knit, handwritten programs. Furthermore, these building blocks encourage the programmer to think of the system in terms of its basic elements, rather than in terms of so many instruction

steps per machine run and other machine details, with the result that a sounder, more logical system is created. Finally, these building blocks place at the programmer's disposal a set of thoroughly tested machine programs, freeing him from the laborious time-consuming task of testing lengthy and complex programs."

Drawbacks are that more care and effort must be taken to establish procedures for the generalized routines, and they require more machine time to accomplish the same thing as the hand-written programs.

AUTOMATIC PROGRAMMING FOR BUSINESS APPLICATIONS

Dr. Grace Murray Hopper, Remington Rand Univac

A four-page pamphlet published by Remington Rand presents an adaptation of Dr. Hopper's paper given at the Armour Research Foundation Symposium. This paper traces the development of automatic programing to answer the increasing needs of business electronics systems.

Automatic programing was the third development, the first two of which were interpretive routines and compilers, and was developed as a method whereby computers themselves could produce routines which would compete with hand-tailored coding. It was expected that later developments would be of assistance to programers and systems analysts.

Differing business routines complicated the design

Beginning attempts in 1955 were devoted to designing a system including a charting technique, a pseudo-code, a method of describing data, a compiler and its library, service routines, and operating and debugging aids. A major difficulty in designing such a system was the fact that routines describing business functions were all different, according to the requirements of the specific business organization. This made it necessary 1) to provide a method of describing business data such as files, items, records, messages, fields, etc., and 2) to provide a means of writing for a particular operation the subroutine to execute that operation on the corresponding data.

The concept became a compiling system with an associated library of "generators," service routines, and data descriptions. The pseudo-code was to be in English words forming comprehensive sentences. Each sentence must correspond to an operation to be performed by the computer, and since these sentences must serve for any computer, the verbs initiating these operations must be broad in their action meaning. Examples are: "Compare inventory on hand with inventory limit; if greater, go to operation 19, otherwise go to operation 13"; "deduct group insurance amount from adjusted pay, increment accumulated group insurance, and

increment total other deductions." The verbs in these sentences correspond to "generators" in the library of the compiler; the nouns correspond to "data-descriptions" either stored in the library or accompanying the run description.

Two files produce the program

Program compilation is a data-processing procedure. Two files of information are supplied: the English sentences (the pseudo-code) stating the sequence of operations to be performed, and the data descriptions giving the subjects of the operations. These two files of information are processed by the compiling and generating routines to produce a third file of computer instructions--the production program.

An operating program in two weeks

Several such coding systems are available. The savings in programing time and costs are greater than expected. In one test of the systems, a group of FLOW-MATIC (Univac) programers was given a gross-to-net payroll run. They were given the pay regulations, the forms for the payroll register, and blank paychecks. It required two weeks to prepare the process chart, write the pseudo-code, compile the program, and correctly run a 4000-man sample.

The aims of the automatic programing systems are reduction of coding costs, time-saving, and elimination of most debugging. Also, the men who know the problem best can define the data processing system and make use of the best coding supplied by the experience of sophisticated programers.

The next steps are to produce a compiler with which to make compilers, and to advance into the area of programing itself, by building on the existing automatic coding systems.

For a copy of this paper, write to: Remington Rand Univac, 315 Fourth Avenue, New York 10, New York.

FILE MAINTENANCE ON MAGNETIC TAPE

David M. Irwin, Aetna Life Insurance Co.
MACHINE ACCOUNTING AND DATA PROCESSING, January-February 1959; pages 24-26.

Some of the basic problems in the use of magnetic tape files are explored. Three problem areas are seen:

1. Reference. The high hourly cost of the equipment prohibits frequent interrogation at the expense of processing.

2. Processing. Extreme precaution is needed to assure adequate controls and error checking on input and output. Also, for economy, runs should be scheduled as infrequently as possible by artificially peaking the processing load.

3. Changes. Editing of input is important because of the opportunity for human error and the fact that original errors will remain throughout the processing.

Running a file for reference purposes only is uneconomical, but batching inquiries has problems of inconvenience. It is suggested that information most called for be recorded on abbreviated files which would be queried and updated daily, while the master is run on a less frequent basis. Aetna has established masters containing different information for billing, statistics, claims, premium history, commissions, and a historial summary of all these. Such a system creates its own problems of accuracy. The company is working toward solution of this problem by creating a master change program in which bare details of the change are inserted just once, with the master change program searching the tape storage for the appropriate action to be taken on each of the master files involved.

AUTOMATIC PROGRAMING SYSTEM

A new automatic programing system, "program optimizer for G-15 operations," has been developed by Bendix Computer Division for its low cost G-15 general purpose digital computer. The system has been nick-named "POGO."

Applications

INVENTORY CONTROL—EXPLOITING THE ELECTRONIC DATA PROCESSOR IN THE AIR FORCE

Leon Gainen, The RAND Corporation, Santa Monica, California
THE JOURNAL OF INDUSTRIAL ENGINEERING, February 1959; pages 32-38

In addition to maintaining up-to-date stock balances, the Air Force inventory control system provides back-up knowledge of system procurement status, existing program requirements, due-in balances, and outstanding obligations owed to other accounts. The system described in this article is now in use for materiel supporting two major aircraft of the USAF. The system performs recordkeeping and analysis of 100,000 items, with an average daily world-wide transaction load of 20,000 communications. The entire 100,000 item master file can be reviewed in less than two hours on the IBM 705-II.

Input data control. All activity affecting the system, wherever it occurs, is reported to the data processing center. Information is edited through programed error checks and through batch controls to assure that complete, correct transmission of transactions takes place. Incoming information is screened to assure that it is applicable to the system by comparison with the stock-number-sequenced file. At this point, also, management control rules can apply to sidetrack any transactions to be eliminated from the processing, or needing management action. In this second case, an action code may be added for recognition and special action by the system during the regular transaction run.

Exceptions are coded for special processing

Since many of the stock items are interchangeable, they are managed in the inventory system as single items, although they have different catalog numbers. Through an indexing process, these items are identified and processed through the substitution and allocation function of the inventory control operation.

Substitution and allocation. Sets of parts which are completely interchangeable are called subfamilies, and are listed in a data file which describes their interrelationships and states the usable balances of these items in the system. For the purpose of controlling issues of critical spares, four stock monitoring levels are established. These levels apply to each subfamily in order to protect the entire subfamily of parts. The substitution and allocation file also carries data which designates which parts may be substituted for other parts. Data collected on the usage of subfamily parts is collected and analyzed to produce requirement factors, procurement quantities, and repair schedules, for management decision.

Transaction posting and management review. The Master File contains balance information and management review codes for each item and for each location in the system. It consists of a set of consolidated records which carry three groups of information: fixed indicative data, system summary data, and location data.

The fixed indicative data consists of catalog information and shipping information. If the part is being managed as a member of a subfamily, it also carries the subfamily index number.

Stock monitor levels issue warnings

In the system summary data of the item record there are the system stock monitoring levels, which are compared with current system assets to determine the shortage or excess quantities. The monitoring levels are as follows: Requirement level, warning point level, allocation level, and reserve level. Serviceable assets held at all storage sites are carried in a summary total as follows: Serviceable summary--stock positioned at any of the storage sites of the system which is ready for issue to a using location; Due-in summary--stock moving into the system; Due-out summary--an existing backlog of unfilled orders. When

compared with the system stock monitoring levels, these quantities tell the manager if the stock is at a satisfactory operating level.

Before any shipping order is written the system stock status is recomputed and compared with the stock monitoring levels to determine whether or not the originating requisition has high enough priority for the shipment. If a shipment causes the system stock status to cross one of the stock monitoring levels, a complete listing of the consolidated record for this item is produced for management attention, and a transaction signal is created to cause a listing later on of all materiel due in.

Other sets of information in the system summary data are reparable summary and work order summary balances which tell the manager about materiel in unserviceable condition which is either available for repair or which is already scheduled into the repair cycle.

Files give location of parts

The location data portion of the master file is used for computing the balances of serviceable and reparable stock and items reserved for special projects for each storage site. A stock control level is carried for each location site of each part, also. Replenishment is scheduled in accordance with these levels.

Transactions are of the following types:

Transaction Notices which change balances: inventory adjustments, change of status (e.g., serviceable to reparable), receipts, shipping directives, requisitions, reversals of previous balance change transactions.

Transaction Notices relating to file information: insertion or deletion of a complete record, catalog data changes, level changes, requests for information.

Batch shipment except in emergency

Although requisitions are received throughout the day, shipments to the bases are on a routine MATS schedule. Highest priority requisitions are batched and processed into shipping orders in a two-hour cycle, while all others are processed in the 24-hour cycle. Processing these orders begins with a breakdown into stock number sequence. Transactions are processed in this order: receipts, reversals, inventory adjustments, status changes, shipping directives, requisitions (including backorders). Requisitions and backorders are ranked according to mission-rating of the requesting unit and the days remaining before the item can be used.

Outputs of the master file processing consist of reports and action notices. Among the reports is a continuous report providing the manager with detailed information on his asset position for each item in inventory. A transaction register is

printed for audit trail purposes as required. System short supply notices are printed automatically when the systems comparison of the stock status with the monitoring levels indicates one of the balances has been reached.

Action Notice

Action notices include the short supply trigger, which lists for the manager all the due-ins as a result of the short supply notice. By analysis of the shortage situation shown by the short supply trigger, the manager can act on his judgment. Status notices are printed out if a requisition cannot be filled at the data processing center, and result in a backorder, cancellation of the requisition, or endorsement to an Air Force depot which holds prime responsibility for the item requested. Shipping orders are the most significant of the action notices, since they direct a storage site to ship a specific quantity of an item to a designated consignee on or before a given date.

Due-in. The due-in function records and monitors the contract obligations between the manager and the suppliers. Due-in transactions are accumulated for a certain number of days and the file is updated with this batch of information at this time, or sooner if an information request is made. At regular intervals a due-in status report is printed for management review in conjunction with a listing from the master file. This information includes an analysis of overdue shipments, shipments on schedule, quantity variations in excess of contract, and similar reports.

MACY'S NEW EDP SYSTEM

RETAIL CONTROL, January 1959; pages 5, 6

Macy's NCR 304 installation will prepare automatically, statements and billings to the 750,000 Cash-Time and Depositor Accounts of the six Macy stores at the rate of 50 a minute. Statements will include purchases made under 24 hours of the time the bill is prepared. Copies of sales slips will be omitted from the statement. Instead, the statement will supply a more detailed record of the customer's transactions. A major problem in cycle billing will be solved with the new system--the accounts receivable department will be able to, in effect, keep daily records and strike a balance at the end of the day.

NEW JERSEY SAVINGS BANK INSTALLS ELECTRONIC DEPOSIT SYSTEM

UNITED STATES INVESTOR, January 24, 1959; page 18.

The United States Savings Bank of Newark has installed a three-way hook-up between NCR Window Posting, Friden Teledata machines, and an IBM computer ((type not mentioned)).

The window machine posts deposits or withdrawals in the customer's passbook and records the transaction on tape. The machine also computes and prints the new balance. The paper tape is transmitted by the Friden Teledata via telephone line to the main accounting room in Orange. The computer then takes over the computing of interest and other bookkeeping chores.

Systems Design

ORGANIZING A NETWORK OF COMPUTERS

Summary Technical Report, National Bureau of Standards

The National Bureau of Standards has been investigating the logical problems arising when several high-speed electronic computers are connected together to work on a common large-scale task: devising an efficient scheme for all the computers to share, automatically, the total workload undertaken by the network; designing a machine instruction system which can carry out these complex operations effectively and yet is simple enough to code easily. A result of this research is the NBS Pilot Data Processor. This system is designed as an integrated network of several computers, so that the total computing task of a large scale problem may be divided up, with all the computers in the system working on the task simultaneously, thereby increasing the speed of the solution.

When several computers are working on portions of one problem, it is obvious that from time to time one of the machines will need to sit idle waiting for data from another machine. To minimize this idle time, queuing-theory techniques were applied to devise optimum schemes for making the computers share a common workload. The present NBS Pilot Data Processor consists of two computers, with a third independent computer specializing in operations that control and interpret the data flowing between the system's internal memory and its external storage and display devices. In the future, it is expected that larger numbers of independent machines will participate cooperatively in the performance of large-scale tasks. Further information may be obtained from the NBS Office of Technical Information, Washington 25, D. C.

TECHNIQUES OF OFFICE COST CONTROL

AMA Report No. 26, Published by American Management Association.

Various aspects of office cost control are included in this booklet, including office reorganization, records management, paperwork, simplification, etc. The third of the three parts is devoted to a study of the EDP system at the Carborundum Company (see: DPD, March 1959, page 2, "Office Management Yearbook").

Carborundum Co. derived planning data from forms in use

The third of the four articles on the Carborundum EDP system covers a subject not included in previous articles about this system. It describes the source-document coding and master file classification aspects of the system. Data requirements were divided into customer data and product data. Specific types of information pertinent to each category were listed by examining customer orders, plant documents, invoice copies and existing records, reports and codes. This information was collected and collated on a master chart. It was found that many discrepancies existed among the various customer records and information sources, and these were run down and corrected during the year it took to build the new file. Plant documents provided the information needed for the product side of the master chart.

Three questions were asked in determining how to use the information: Can the data be standardized? Are the data always alphabetic or numeric, or a combination of both? Can a fixed number of digits be established per datum; if not, what should the maximum be? These questions were resolved through consulting liaison personnel from sales and plant offices. Decisions were made as to whether or not information should be expanded for future requirements, and conflicting requirements between administrative units were resolved.

As decisions were made, the master chart was expanded to show information areas, fixed or variable information requirements, alphabetic or numeric representation, and number of digits allowed. The next step was to identify the data with input and output requirements. Illustrations showing portions of the successive charts used to record and sort out the collected information are included in the article.

Price of the AMA Report No. 26 is $3.00 ($2.00 for members of AMA).

HOW TO RE-ORGANIZE FOR BEST USE OF SYSTEM STAFF AND MACHINES

Richard A. Gilbert, McDonnell Aircraft Co., St. Louis, Missouri
MANAGEMENT METHODS, January 1959; pages 33-35; 63-65.

In order to use the full capabilities of their EDP equipment, McDonnell Aircraft Company re-organized their entire systems function. These were the steps they went through:

1. Established an over-all corporate systems function.

2. Grouped into this systems department are the functions of corporate systems, computer planning and programing, and data processing operations.

3. A separate systems function was established within each operating division of the company.

4. Developed a strong relationship between the corporate systems department and the divisional systems groups.

The divisional systems groups have absolute prerogative within their own divisions as long as their efforts do not cross divisional lines and involve other divisions. If a systems project is so broad as to include more than one division, the corporate systems department enters the planning and coordinates the efforts of the divisional systems groups involved.

Systems people work in same area

An important aspect of the program is that all systems people and equipment are in the same physical area. This has helped break down the communications barriers that normally exist between operating divisions. An independent check on the corporate systems department is performed continuously by the internal audit department. The function of the auditors is to observe and become familiar with the systems development work in progress, and to evaluate the new systems from an audit viewpoint. In this way, new audit programs are developed and made an integral part of the system.

General Information

ACCOUNT VERIFICATION WITH "ALPHA DIGITS"

C. C. Long, National Newark and Essex Banking Co., Newark, New Jersey
AUDITGRAM, February 1959; pages 42, 43

The National Newark & Essex Banking Company has devised and successfully tested a system of account selection by alphabetic identification rather than numeric. NCR is interested in the system and has named it the "alpha digit" plan. The bank wanted to develop a system that would have the advantages of checking account verification without the use of an account numbering system. The numbers of the Postronic comparator keyboard have been changed to letters, and certain letters in the customers' signatures are entered as the account number. These are compared with the corresponding alphabetic code on the customer's ledger card. The rules for using letters are:

Account numbering without numbers

1. Index the last letter of the first name, the middle initial, and the last letter of the last name.

2. For account titles having only first and last names, index first and last letters of given name and last letter of last name.

3. For account titles having only an initial and a name, index the initial and the first and last letters of the name.

4. For account titles with two initials and a name, index the initials and the last letter of the name.

For business accounts, these variations are necessary:

1. Common geographic names are eliminated from the coding. The remainder of the name is used for coding.

2. Common business terms, such as "company," are encoded if there are less than three words in the title.

During the testing period, the system was run in parallel with the former system. The results of the tests were as follows:

The alpha-digit Post-Tronic saved 50% of the former posting time. Only one erroneous posting was made in a period of two months. For the first time in many years the operators really looked at the signatures on checks.

"To install the alpha-digit method, it is only necessary to transfer balances and encode on the Post-Tronic statement-ledger sheets the code corresponding to the particular account's initials. No imprinting of checks or other operation is necessary."

ACCOUNT CODING SYSTEMS

C. Clifton Pruitt, Union Trust Company, St. Petersburg, Florida
AUDITGRAM, February 1959; pages 4-7.

A description is given of the various types of account coding: straight numeric, alpha-numeric, alpha-numeric with letter prefix, and random digits. The method of setting up each type and advantages and disadvantages of each type are given. The straight numeric method is simple to assign and has a minimum number of digits. Also, sorting speed is high. However, alphabetic sequence is lost, and new accounts are bunched in the last ledger.

In the alpha-numeric method, new accounts are pro-rated among the ledgers, all accounts are in alphabetic order, and the system is adaptable to any electronic system. However, the installation is more complicated than straight numeric, since new number assignment requires some computation, and it is possible to run out of numbers. Also the number of digits needed is large, and if accounts are merged, the new account must be coded and interfiled with established numbered records. Using a letter prefix provides absolute letter control with a smaller number, although combining numbers and letters in processing is difficult. Random digits are simple to assign, and alphabetic sequence is retained, but this system has only one use--account identification.

RETAIL ACCOUNT NUMBERING

Eldon C. Higgins, Le Febure Corp., Cedar Rapids, Iowa
RETAIL CONTROL, January 1959; pages 9-33.

Requirements for an account numbering system for retail charge accounts are analyzed and various methods are evaluated. A method of account numbering for retail credit accounts is suggested and described. This is "Alphabetic Random Access in Numeric Sequence." In this method, accounts would be subdivided alphabetically into groups approximately 17 to 22 in number. The growth factor is then estimated--five times present size in the example given--as follows:

First number	000-000
Last number of group	000-019
For future expansion	000-020 000-100

Standard account numbers for city-wide use

This will provide a starting number for each alphabetic group. Accounts are numbered consecutively with each group, and new accounts are assigned the next number in their group. To find an account alphabetically (which is needed frequently in retail sales transactions when the customer does not carry her charge-plate), the Scan-Dex method is suggested. For example: "Let's find the name, Guy R. Abbott

1. Select the alphabetic file tab AA and open the file.
2. Select the box in the Scan-Dex panel showing the letter G which is the first name letter.
3. In that position, scan back to the tab bearing the middle initial, R, and open the file."

"Assigning a number to a new account is extremely simple and a very positive operation. Upon learning the customer's name, the interviewer will merely select an application with the tab in the proper first name position. The application is completed in the normal manner."

It is suggested that in cities where the Credit Bureau operates the Central Charge Plate Service, the master account number for a credit customer would be controlled and located at the Credit Bureau for all the customer's accounts. Thus, credit references from all the participating stores would be rapid and accurate, circularization of bad account lists would be less costly and more accurate, standardization of account numbering would permit any store in the group to install new electronic methods without disrupting the basic operation

of other stores, the account numbering system would be ready for any store going into electronic systems, and it would preclude action by any store which might set a limiting pattern for the group.

ILLINOIS BANK ADOPTS PUNCHED CHECK SORTING

BURROUGHS CLEARING HOUSE, February 1959; pages 22, 24.

The University National Bank of Peoria has added to its check design, a row of pre-drilled holes across the top edge, number coded in the 1-2-4-7 manner. After the checks have been personalized and numbered, the account number is punched out in the top edge. When checks return to the bank they are needle sorted--as high as ten times faster than by hand sorting. A by-product of the system is that misfiled checks are easily spotted because the difference in the punches at the top shows up very plainly.

MACHINE PROCESSING OF PRODUCTION DATA

Norman J. Ream, Lockheed Aircraft Corporation, Burbank, California
CHEMICAL ENGINEERING PROGRESS, January 1959; pages 51-54.

Realizing that business can no longer depend upon manual data processing to provide the information needed for management decision-making, Lockheed has embarked upon a company-wide integrated approach to the problem.

The objectives of the integrated approach are:

1. Development of improved management intelligence for use in decision-making processes.
2. The reduction and control of time spans.
3. Improved accuracy.
4. Increased productivity.
5. Reduced costs of operation.

The administrative systems problem consists of formulation of the problem, logical design, and detailed systems design. Research techniques are needed, along with an attitude of objectivity, in which those working on the system are not unduly influenced by existing systems.

Four areas of activity have been covered by the integrated system: order control, base schedules, direct hour forecast, and purchase parts inventory control. Planned for future integration: engineering operations, finance and accounting areas. Similar programs have been progressing simultaneously at the other Lockheed divisions.

HOW TO SURVIVE IN THE SYSTEMS BUSINESS

William D. Bell, Consultant, Tucson, Arizona
CONTROL ENGINEERING, February 1959; pages 86-88.

The factors that limit immediate profit-making for systems companies are listed. ((It appears that these factors could apply equally well to electronic computer manufacturers.)) They are: 1) The high cost of sales which involves educating the customer, and the fact that in system design there are many optional designs possible. 2) Engineering costs, which involve the attempt to standardize without freezing design, and the need for constant research and development. 3) The job-shop type of manufacturing necessary for systems equipment. 4) Maintenance service for the customer. 5) An accounting system that reflects the job-shop nature of the business.

ELECTRONIC INFORMATION SYSTEMS IN NAVY MANAGEMENT

W. H. Hill, Navy Management Office
NAVY MANAGEMENT REVIEW, January 1959; pages 20-24.

The Navy is now in stage four of a six-stage management information system. The six stages of development are:

1. Evaluation of mathematical formulae (this was during the war, and management information systems were not yet the goal).
2. Discovery of the potential value of electronics applied to clerical work, during post-war years.
3. 1950 to 1955, improvement of electronic equipment.
4. 1955-1960, initial acquisition in quantity of EDP systems.
5. 1960-1965, a period of refinement and basic system change.
6. 1965-1970, widespread replacement of present equipment.

Equipment

A REPORT FROM THE MANUFACTURERS, 1958

Published by COMPUTING NEWS

The Proceedings of the Symposium on Small Automatic Computers and Input/Output Equipment, which followed the Western Joint Computer Conference last May, has been published by COMPUTING NEWS in that publication's distinctive size and style. Good, informative papers are presented on the following: G. E. Character Reader, Selfchek character code developed by Intelligent Machines, Datamatic 1000 output system, output devises using the charactron of Stromberg Carlson, Telemeter Magnetics data translators, IBM 610 Auto-point computer, and the Recomp II digital computer.

Discussions are technical, factual and well illustrated. The proceedings may be purchased from COMPUTING NEWS, 12805 - 64th Ave. South, Seattle 88, Washington. Price, $2.25.

FLIP: FILM LIBRARY INSTANTANEOUS PRESENTATION

Reprinted from LIBRARY RESOURCES AND TECHNICAL SERVICE, Fall, 1958.

The Benson-Lehner Corporation of Los Angeles has designed a machine named the Film Library Instantaneous Presentation to locate quickly any desired frame in a 1200-foot reel of 16 mm. microfilm. The film is then projected on the built-in viewing screen. Although the machine was designed especially for one particular use, in which the microfilm was numbered serially, the company believes there may be other library uses, and invites suggestions relating to library applications. Write to D. B. Prell, Vice-president of Applications Engineering, Benson-Lehner Corporation, 11930 West Olympic Blvd., Los Angeles 64, California.

Comment

THE "SYSTEMS" PHILOSOPHY

Last month, we reviewed a thought-provoking article by Peter F. Drucker[1] on the status of management science. His main thesis is that a review of the literature reveals that there is much

more emphasis today on techniques than on principles, efficiency of the part rather than of the whole, mechanics rather than decisions. Because of this, he says, the approach all too often used is, "Where can I apply my beautiful gimmick," rather than gaining a basic understanding of the manager's problem. The planners do not see a business as a system of the highest order, with a multitude of interrelated parts.

"How to—" rather than "Why?"

In focusing our attention on one aspect of management science--electronic data processing--we find that the literature does show that the emphasis is on techniques, rather than principles: how to set up a magnetic tape file, how to use random access memory more efficiently, how to reduce the cost of programing. But occasionally there is evidence that some deeper systems study is taking place.

While we would expect that the development of principles should come from the colleges and universities, actually the significant projects known to us are mostly in private industry, and in some cases in government and military operations. Where the projects are private, they have been kept under wraps to a great extent, so that little or no published information is available.

There are a few noteworthy "EDP" projects in this country which are aimed at developing a basic understanding of the management problem. We put quotes around EDP because in some cases the projects started out under this name--but rather soon, the primary emphasis shifted from the application of EDP to gaining an understanding of the business. Let us take a few moments to explore how such a project might be conducted.

Management science team asks questions about the business

Customarily, in this type of high-quality project, the team approach is used; it is not a one-man affair. Moreover, the team members are picked for their brains, not their seniority or availability. The best talent available to the organization (both inside and out) is tapped--even if just on a part time basis. Often, too, there is need for some junior data-gatherers.

Before trying to apply EDP, linear programing, or mathematical statistics, the team begins by asking, "Just what business is this organization in? What are the characteristics of this business?" These questions are never easily answered.

To take an example, one answer might be, "We are in the wholesale drug business." To a good team, this really doesn't answer much; it just raises many more basic questions. Does this firm supply its own chain of drug stores, or does it supply a number of independent druggists, or does it cover a combination? If a chain is served, to what extent can the requisitions from the drug stores be controlled? How quickly must commodities be delivered to the stores in order to be competitive? (A wholesale house serving the independents often has far less control over when orders are received; the independent druggist gives his order to the wholesale

house that gives the fastest service, and helps him keep his inventory down.) And the team probably will not be satisfied with this level of analysis; it will also want to ask, "What types of commodities and services does the business now offer? Should some be dropped or added? Can we give a wider customer selection with a smaller set of components, by providing a rapid means of assembling components to fill customer orders?" Questions such as these obviously involve a large understanding of the business, as well as detailed study and analysis of the specific problem areas.

Define the inputs and outputs first

This team would not be concerned too much with a study of present procedures--what the clerks do in handling the different types of orders, etc. Rather, the team is looking for "what comes into the business, over which it has little control," and "what goes out of the business, to meet requirements over which it has little or no control." Having defined inputs and outputs, the team will set about designing an efficient system to perform the translation from input to output.

What does the team need to know to perform such a study? First and foremost, it should develop a deep understanding of the business. Second, the team members should have the ability for clear, logical thinking. At least some of the members should have proved ability in creative thinking. The team members should have training in scientific disciplines--especially mathematics. (In this area, we wish someone would develop principles on "how to apply servomechanism design techniques to the design of a management system.") Finally, the team should have access to knowledge of data processing tools and requirements--the sorts of things we have discussed in the January and February Comments this year.[2, 3]

General principles will appear from many studies

As we mentioned earlier, Mr. Drucker asks for more basic research than our example covers--for instance, research on the characteristics of different types of wholesale operations. At present, each team has to uncover these characteristics for itself, but there must be general principles which apply. These will begin to emerge as the results of numerous such studies are available. This process can be speeded up by universities which are willing to pursue the basic research called for in Mr. Drucker's article.

REFERENCES

1. "Thinking Ahead: Potentials of Management Science." by Peter F. Drucker, HARVARD BUSINESS REVIEW, January-February 1959. Reviewed in DPD, March, 1959, page 1.
2. "Bank Automation," DPD, January 1959, page 15.
3. "Bank Automation, Continued," DPD, February, 1959, page 18.

References

The publishers of books and periodicals mentioned in this issue of DATA PROCESSING DIGEST are listed below for your convenience in writing for more complete information.

American Management Association
1515 Broadway
New York 36, New York

Auditgram
38 S. Dearborn Street
Chicago 3, Illinois

Burroughs Clearing House
2nd and Burroughs Avenue
Detroit 32, Michigan

Chemical Engineering Progress
25 W. 45th Street
New York 36, New York

Computing News
12805 - 64th Ave. South
Seattle 88, Washington

Control Engineering
330 West 42nd Street
New York 36, New York

Journal of A. C. M.
2 East 63rd Street
New York 21, New York

Journal of Industrial Engineering
145 North High Street
Columbus 15, Ohio

Machine Accounting & Data Processing
956 Maccabees Building
Detroit 2, Michigan

Management Methods
22 West Putnam Avenue
Greenwich, Connecticut

Navy Management Review
Supt. of Documents
U. S. Government Printing Office
Washington 25, D. C.

Office Management
212 Fifth Avenue
New York 10, New York

Retail Control
100 West 31st Street
New York 1, New York

United States Investor
286 Congress Street
Boston 10, Mass.

DATA PROCESSING DIGEST is published each month by Canning, Sisson and Associates, Inc., 1140 South Robertson Boulevard, Los Angeles 35, California. Subscription rate: $24.00 per year. Foreign postage (exclusive of Canada and Mexico): $2.50 additional. Single copies: $3.00 when available. Editor: Margaret Milligan

Meetings

"Automation Progress in Chemical, Oil Industries," sponsored by the Instrument Society of America

Date: April 6, 7, 1959
Place: St. Louis, Missouri (Statler Hilton Hotel)
Information: Instrument Society of America, 313 Sixth Avenue, Pittsburgh 22, Pennsylvania

Life Office Management Association Automation Forum

Date: April 13-15, 1959
Place: Chicago, Illinois
Information: Life Office Management Association, 110 E. 42nd St., New York 17, New York

Management Engineering Conference, sponsored by the Society for Advancement of Management and the Management Division of American Society of Mechanical Engineers

Date: April 23, 24, 1959
Place: New York City (Hotel Statler)
Fee: $47.50 ($37.50 for members), including proceedings
Information: Society for Advancement of Management, 74 Fifth Avenue, New York 11, New York

"Improving Research Productivity," sponsored by The American University, Fourth Institute on Research and Development Administration

Date: April 20-24, 1959
Place: Washington, D. C. (Downtown Center of the University)
Fee: $90.00
Program: Discussions on the administration of an R & D program, including new techniques in scientific information classification, storage and retrieval
Information: Lowell H. Hattery, The American University, 1901 F Street, N. W., Washington 6, D. C.

ORSA National Meeting

Date: May 14, 15, 1959
Place: Washington, D. C. (Shoreham Hotel)
Information: Operations Research Society of America, Mt. Royal & Guilford Ave., Baltimore 2, Md.

Fourth Annual Electronic Data Processing Conference, sponsored by local chapters of AIEE, SAM, Society of CPA's, NMAA, etc., and University of Alabama

Date: May 14, 15, 1959
Place: University of Alabama
Information: Gordon E. P. Wright, Director of Commerce Extension Services, University of Alabama, P.O. Box 2987, University, Alabama

"Expanding Horizons of Industrial Engineer," National Conference, American Institute of Industrial Engineers

Date: May 14-16, 1959
Place: Atlanta, Georgia (Biltmore Hotel)
Fee: Members, $39.50; non-members, $49.50. (Single event fees also available)
Information: AIIE, 145 North High Street, Columbus 15, Ohio

NOMA Conference and Exposition

Date: May 24, 27, 1959
Place: New Orleans, Louisiana (Roosevelt Hotel)
Information: W. H. Latham, NOMA, Willow Grove, Pennsylvania

International Conference on Information Processing

Date: June 13-23, 1959
Place: Paris, France (UNESCO House)
Information: U. S. Committee for the First International Conference on Information Processing, Box 4999, Washington 8, D. C.

International Accounting Conference

Date: June 21-24, 1959
Place: New York (Waldorf-Astoria)
Information: Robert F. Nolan, National Association of Accountants, 505 Park Avenue, New York 22, N. Y.

British Computer Society First Annual Conference

Date: June 22-25, 1959
Place: Cambridge, England
Information: British Computer Society, c/o University Math. Lab. Corn Exchange Street, Cambridge, England

NMAA National Conference

Date: June 24-26, 1959
Place: St. Louis, Missouri (Chase-Park Plaza Hotels)
Information: National Machine Accountants Association, 208 South Main Street, Paris, Illinois

Sixth Annual Symposium on Computers and Data Processing, sponsored by Denver Research Institute

Date: July 30, 31, 1959
Place: Estes Park, Colorado (Stanley Hotel)
Program: Four half-day sessions devoted to each of following: Components, Logical Design, Computer Design, Systems Organization
Information: Denver Research Institute, University of Denver, Denver 10, Colorado

1959 ACM National Conference

Date: Summer, 1959
Place: M.I.T.
Information: F. Verzuh, Massachusetts Institute of Technology, Cambridge, Mass.

TIMS International Meeting

Date: September, 1959
Place: Paris, France
Information: The Institute of Management Science, Attn: Harold Cauvet, 250 North Street, White Plains, New York

ISA Conference

Date: September 21-25, 1959
Place: Chicago, Illinois
Information: Instrument Society of America, 313 Sixth Avenue Pittsburgh 22, Pennsylvania

International Automation Exposition-Congress

Date: November 16-20, 1959
Place: New York (Trade Show Bldg.)
Information: Richard Rimbach, 845 Ridge Ave., Pittsburgh 12, Pa.

Training

"Management Concepts in Operations Research," presented by Harvey N. Shycon Company

Date: April 6-8, 1959
Place: Boston, Mass. (Harvard Club)
Fee: $200.00
Content: Includes practical examples of applications of OR techniques in actual business situations.
Information: Harvey N. Shycon Company, Park Square Building, Boston, Mass.

"Successfully Installing an Electronic Data Processing System" (Course 20), presented by Richard G. Canning

Date: April 20-24, 1959
Place: New York (Hotel Biltmore)
Fee: $250
Program: Organization, personnel, physical installation, conversion, operation of the EDP system are the subjects covered. It is desirable, but not required, that attendees have taken Course 10 or its equivalent.
Information: Richard G. Canning, 1140 South Robertson Blvd., Los Angeles 35, California

"Electronic Data Processing for Business and Industry" (Course 10), presented by Richard G. Canning

Date: June, 1959
Place: New York (Barbizon Plaza Hotel)
Fee: $250
Program: Emphasis on the applications aspect of electronic data processing. Four guest lecturers on specific applications.
For whom: Management personnel charged with setting up an EDP system
Information: Richard G. Canning, 1140 South Robertson Blvd., Los Angeles 35, California

Automation in California, A Conducted Tour of Practical Applications

Date: June 15-27, 1959
Place: Tour leaving San Diego, and visiting EDP installations and computer manufacturers in Los Angeles, Pasadena, San Francisco, Palo Alto, and other points
Fee: $125 (including rooms, but excluding meals)
Registration deadline: April 15, 1959
Information: Dr. E. Dana Gibson, San Diego State College, San Diego, California

Industrial Engineering Seminars, Cornell University

Date: June 16-19, 1959
Place: Cornell University, Ithaca, New York
Program: Seminars on Industrial Management, Manufacturing Engineering, Engineering Administration, Small Plant Management, Methods and Work Measurement, Computers in Production Planning, Applied Industrial and Engineering Statistics, Statistical Aspects of Component Reliability. Also general sessions.
Information: Andrew Schultz, Dept. of Industrial and Engineering Administration, Upson Hall, Cornell University, Ithaca, New York

"Successfully Installing an Electronic Data Processing System" (Course 20), presented by Richard G. Canning

Date: July, 1959
Place: New York (Hotel Biltmore)
Fee: $250
Program: See above
Information: See above

University of Michigan Engineering Summer Conferences, including these two courses of interest to programing and systems engineering persons: "Computer Programming and Artificial Intelligence," and "Foundations and Tools for Operations Research and the Management Sciences." Other courses are designed particularly for the computer design engineer. Fee for each conference mentioned above is $225. Dates for each are June 29 through July 10, 1959. For information, write to: Engineering Summer Conferences, 2038 East Engineering Building, University of Michigan, Ann Arbor, Michigan.